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ABDOMINAL  
SURGERY  
ON THE  
BATTLE-FIELD.



N. SENN, M.D., PH.D., LL.D.,

President Association of Military Surgeons of the United States; President Association of Military  
Surgeons of Illinois; Surgeon General of the National Guards of Illinois.



## Abdominal Surgery on the Battle-field.

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Military surgery will always be regarded in the light of a specialty in surgery. The principles which govern its practice are the same as those which guide the civilian surgeon in his work, but the art is as widely at variance as the circumstances which demand its application. The science and art of surgery have undergone such radical changes during the last decade that nothing short of complete revolutionary changes in this special department will bring it up to the same enviable degree of perfection and usefulness as surgery in civil life. The military surgeon must keep abreast of the times, in order to secure for those placed in his charge the blessings to be derived from the application of the many important and valuable facts brought forward by modern investigation and research. Since the great war of the Rebellion and the more recent Franco-Prussian struggle, military surgeons have had only limited

opportunities to make practical use of the great advancements which characterize modern aggressive surgery. For the good of humanity military surgery has been retarded by an epidemic of peace. Let us hope that the time is far distant when it will receive a new impetus from bloody conflicts on a large scale. As military surgeons, however, it is our duty to prepare for the future so that whenever called upon, we will be prepared to meet the emergencies of recent warfare. The three great factors which will modify the practice of surgery on future battlefields will be: (1) Prevention of wound infection. (2) Conservative treatment of gunshot injuries of the extremities. (3) Prompt direct operative interference in the treatment of penetrating wounds of the large cavities, a field heretofore almost entirely neglected with the consequence that in a large proportion of cases death resulted either from the





injury *per se* or some immediate complication. All of these subjects present sufficient importance to claim the most serious attention of every member of the Association, but the scope is too extensive to be covered by an address which is necessarily limited as to time and which would require better opportunities for actual experience than have come within my reach for a thorough elucidation. It is my intention on this occasion, our fourth annual meeting, to discuss a few of the most important points of an entirely new department in the service of the military surgeon of the future—viz: *Abdominal Surgery on the Battlefield*.

Since the close of the last great wars the inventive genius has been busily engaged in devising new weapons and other implements of destruction. The smokeless powder and the jacketed small calibre bullet have revolutionized modern warfare. Rapid firing at a greater range and certainty of aim will make the battles of the future of short duration, but the loss of life and the number of disabled and maimed will be greater than ever. The wounds that will come under treatment on the battlefield will present an entirely different aspect, and will demand different treatment than those inflicted by the old weapons. The new bullet, by virtue of its greater velocity and penetrating power, will either produce speedy death or the injury which it inflicts will be more amenable to successful treatment because it produces less contusion of the soft tissues and splintering of bone than the heavy leaden bullet used in the past. Beck, Bruns, Delorme, Langier, Roget, Bardeleben, Helferich, Kocher, La Garde, Griffith, and others have made careful experimental researches concerning the effect of the new projectile upon the different tissues at variable distances, but this subject

is not exhausted and further studies must be made to furnish the final positive demonstrations.

During the beginning of our Civil War, our infantry was supplied with the old Springfield muzzle loader. The bullet was conical and had a diameter of fifty-eight hundredths of an inch and a length of about one inch, and was fired at a velocity of about one thousand feet a second. The Karg-Jorgensen, and similar small calibre guns are made to fire a jacketed bullet about an inch and one-third in length, and only thirty hundredths of an inch in diameter. The modern bullet consists of a jacket of thin steel, or of German silver, filled with lead and nickel plated. Its construction is such that it is but little deformed even in striking the hardest substances and as the smokeless powder imparts to them a velocity double of that of the old bullet, it is less liable to deviate from its original course and produces much less laceration of soft parts and comminution of bone. The wounds inflicted resemble more closely incised than lacerated wounds. The old bullet produced more laceration and shock than the new missile. The new bullet inflicts wounds which resemble the injuries caused by the old weapons within a distance of 350 yards, and as most of the wounds will be produced at a greater distance the surgeon will have to deal with injuries resembling incised or punctured wounds. The bullet will also be less liable to carry before it infected foreign substances and to lodge in the body, consequently the wounds will be less liable to primary infection and consequently, better adapted for successful conservative treatment. In so far as pertains to the efficient treatment of wounds of the extremities all are agreed as to the best course of treatment to be pursued. Rigid antiseptic and aseptic measures



will be carried out at the first dressing station and rest will be secured by extemporized means of immobilization and the patients sent to the rear with a message informing the hospital surgeons whether or not the first dressing must be changed or whether more efficient antiseptic measures are required, or complications to be treated. Very little has been done so far in the way of aggressive surgical interference for heroes who fell mortally wounded in the line of battle in the defense of their country, their ruler, their families, their homes and their rights. The time has

to direct means of hæmostasis. In future wars it should be made the sacred duty of every civilized nation to do all that modern surgery can accomplish in the treatment of perforating gunshot wounds of the abdomen at the first dressing station located as near as possible to the fighting line. Every soldier who has been in active military service can recall instances where comrades dropped in the ranks with a mortal bullet wound of the abdomen, who lived for several hours and died from hemorrhage, often forgotten and uncared for in the excitement of the con-



First aid from behind the line of battle. Looking toward the first dressing station. [The field scenes were photographed by Captain Ives and Lieutenant Newgarden at Fort Sheridan.]

come when in case of war adequate provisions should be made on the field of battle near the fighting line for the prompt treatment of perforating gunshot wounds of the abdomen. It is difficult to conceive how many valuable lives have been sacrificed on the field of battle during the innumerable bloody conflicts recorded in the history of the world which now could be saved by prompt and efficient surgical interference. Thousands of lives have been lost from internal hemorrhage alone which at the present time could be saved by abdominal section and resort

to direct means of hæmostasis. Justice, patriotism, humanity and the present status of abdominal surgery demand that in future wars a well regulated hospital corps shall render efficient first aid, promptly convey the severely wounded to the first dressing station where they can receive further surgical aid, and where, if die they must, the last hour of their life shall be peaceful, surrounded by those who will add to their comfort and administer words of consolation as the immortal spirit leaves the maimed body for its eternal resting place. It is my firm conviction that military surgeons will



follow the precepts and practice of the progressive and aggressive civilian surgeons in the treatment of visceral injuries of the abdominal cavity on the first opportunity that presents itself. To permit a wounded soldier to die from hemorrhage of a wound of one of the abdominal organs, which otherwise would not prove a source of immediate or remote danger, is in conflict with the duties of the country to its defenders, and a reproach upon modern surgical practice on the battlefield.

Two leading indications will present themselves in the treatment of penetrating gunshot wounds of the abdomen. (1) Arrest of hemorrhage. (2) Direct treatment of visceral wounds.

The timely treatment of visceral injuries of the abdomen on the battlefield will require improved facilities for transportation of the wounded and an adequate hospital corps force to render the first aid and transport the wounded to the first dressing station and later to the field hospital. In the regular army a faithful effort is now made to build up an efficient and well-equipped hospital corps. The Surgeons of the National Guard should use their influence in securing uniform legislation in every State of the Union looking toward the organization of a similar special military service. So far but little has been done in this direction. The hospital corps service should be modelled as closely as possible after that of the regular army. The members of the corps should, of course, be non-combatants and well instructed in their special work. The members should at least possess a good common school education and sufficiently familiar with minor surgery to act as trustworthy assistants in emergency operations. During the beginning of an engagement the hospital corps under the command of the officer in charge is stationed at the am-

balance station in some protected locality and sufficiently to the rear of the fighting line to be out of range of the small arm bullets. From here the members set out with litters and supplied with the necessary articles to render the first aid. Each member should be able to make a quick and reliable diagnosis between shock and the complexus of symptoms resembling shock produced by internal hemorrhage. In shock the maximum symptoms appear immediately after the receipt of the injury while in hemorrhage the symptoms gradually increase in intensity with the loss of blood. This distinction has an important practical bearing as the administration of stimulants increases the danger from hemorrhage while it mitigates the symptoms of shock. The treatment of internal hemorrhage should receive attention on the part of those who first come in contact with the wounded. The patient must be kept in the recumbent position and should be cautioned not to make the least muscular exertion. The first aid in such cases should consist of measures best calculated to retain within the blood vessels as much blood as possible and to place the visceral wound in the best possible condition for the formation of a thrombus.

I know of only two indirect means to accomplish these objects, viz.: (1) Constriction at the base of the extremities. (2) Pressure over the seat of injury. Constriction at the base of one or more extremities sufficiently firm to arrest both the arterial and venous circulation will preserve the blood contained in the extremity at the time the constrictor is applied and will lighten the heart's action to an extent corresponding with the amount of blood excluded in this manner from the general circulation. In this manner a sufficient amount of living blood could often be





First Dressing Station.

retained in the body to carry on the functions of life after the cause of bleeding has been removed by direct hemostatic measures. The wounds of entrance and exit are covered with an antiseptic pad. The suspenders of the wounded soldier, the gun-strap, the belt, or strips of his clothing could be used to make the adequate number of circular constrictions. Direct pressure over the wounded organ will diminish its vascularity, and bring the tissues of the tubular wound in contact, conditions which will favor spontaneous arrest of hemorrhage by the formation of a blood-clot. Pressure to meet these indications can be made by applying over the wound of entrance protected by an antiseptic pad a compress composed of the canteen, the cartridge box or an article of clothing and held in place by the belt, the gun-strap, suspender or a strip of clothing. After such temporary aid the patient should be transported as quickly as possible from the fighting line to the ambulance station and from there to the field hospital. For obvious reasons the first dressing station is not the place for operations upon any of the abdominal organs.

The ever varying position of the line of battle, the inadequate supply of instruments and dressing materials as well as the exposure more or less to the dangers incident to active warfare prohibit any operations requiring abdominal section in such close proximity to the danger line. Patients suffering from penetrating wounds of the abdomen should be transported on the same litter in the ambulance from the battle-field to the field hospital, as gently and as quickly as circumstances will permit. The new weapons will make it necessary to establish the first dressing station and the field hospital at a more distant point behind the fighting line than heretofore. The first dressing station should be in some protected place, in a ravine or behind a building while the latter should be in a place farther in the rear entirely out of reach of the infantry fire and in a place protected against the fire of artillery. While I am extremely anxious to impress upon the members of this Association the importance and justifiability of abdominal section upon the battle-field as a life-saving operation I am equally conscious of the responsibility which accompanies the



teaching and practice of such a new departure in military service. The indiscriminate adoption of such a practice by all military surgeons would in all probability increase rather than diminish the mortality of penetrating wounds of the abdomen. Abdominal section under such trying circumstances requires an unusual degree of moral courage and special skill. Surgeons to whom such a task will be assigned must be thoroughly prepared for their work.

*The correct diagnosis and proper treatment of gunshot wounds of the stomach and intestines require a degree of skill and dexterity which can only be acquired by operations on the cadaver and experiments on the lower animals.*

An accurate knowledge of the anatomy and topography of the abdominal organs is an essential prerequisite to the student of abdominal surgery. The necessary manual dexterity can only be acquired by actual work and practical demonstrations. No amount of reading and hearing will bring the necessary skill. Even the minutest descriptions of the details to be observed and applied in the diagnosis and treatment of gunshot wounds of the abdomen are utterly inadequate to prepare a surgeon to interpret correctly the symptoms and signs presented by penetrating gunshot wounds of the abdomen, or to meet the often unexpected emergencies in their treatment. The establishment of the Army and Naval Medical Schools is a source of congratulation not only to the respective services of the Government but also to every surgeon of the National Guard. To them we shall look foremost for the needful advancements in military surgery. They should and will be the authoritative exponents of the much needed improvements of surgery on the battlefield. I trust they will in their curriculum include instruction that will prepare in each branch

of the medical service men who will be competent to perform the most difficult operations upon any of the abdominal organs at a moment's notice with the simplest instruments, with few assistants and the most primitive surroundings; with such a nucleus abdominal surgery in military practice will soon become a favorite subject for discussion and the battlefield of the future will bring new laurels upon the many achievements of modern surgery.

Operative courses on the cadaver are valuable and useful, but they never can take the place of experiments on the living animal in acquiring a practical knowledge of abdominal surgery. This is more especially true in reference to the required manual dexterity in the surgical treatment of internal hemorrhage and wounds of the abdominal viscera. A certain amount of experimental experience is absolutely required in the preparation of the surgeon for this kind of abdominal work which requires not only courage, good judgment, and a thorough knowledge of every step in diagnosis and treatment, but also a certain manual dexterity which cannot be acquired in any other way. We can hardly hope that every military surgeon will acquire the necessary qualifications for such work. Nor is this necessary. Abdominal surgery on the battlefield will constitute only a small part of the work required of the surgeons during an engagement. Many penetrating wounds of the abdomen will prove speedily fatal. Those cases which survive the immediate effect of the injury and are in a condition to justify abdominal section will be comparatively few. The abdominal work should be done by surgeons who possess special skill and experience. At least one surgeon in every brigade should be stationed at the field hospital whose duty it should be to superintend the



preparations and perform the operations. The most successful laparotomists need the fewest assistants and instruments. In military practice their example should be followed. During an engagement on a large scale the surgeons and members of the hospital corps are always overtaxed, by urgent demands from all directions. Excitement and confusion reign everywhere. The deafening roar of the artillery, the rattling of the infantry, the commands of the officers, the groans of the wounded, the rumbling of the ambulances are well calculated to

corps, a laparotomy for gunshot wound of the abdomen can be made quickly and successfully provided careful preparations have been made beforehand.

#### PREPARATIONS FOR OPERATION.

The field-hospital will be either a building used temporarily for hospital purposes or a hospital tent. In the former case the operating room should be cleared of all furniture and draperies, the floor, walls and ceiling sprinkled with a strong solution of carbolic acid or corrosive sublimate.



Ambulance Station.

excite curiosity and to deviate the novices from the strict line of duty. It is under such circumstances that the surgeon who is to perform the most difficult operations in surgery must be in full possession of all of his mental faculties if his work is to save many of the lives placed in immediate jeopardy from the effects of the enemy's bullets. Ample preparation must be made beforehand otherwise valuable time is lost and many lives sacrificed that might be saved by prompt action. With two skilled assistants, an assistant surgeon, and a member of the hospital

A portable sheet-iron stove heated by coal oil will answer the purpose of heating the room and sterilizing the instruments and the water used during the operation. Two large tin pails, one for cold and the other for hot sterilized water and three large wash-basins of *granite ware*, and a dipper of the same material will answer the purpose of handling the antiseptic solutions and sterilized water. Sterilized gauze should take the place of sea sponges. The instrument case that I devised some time ago and which I have called the emergency pocket operating case,



contains all the instruments needed and as it contains needles and the necessary suture material everything in the way of instruments, ligatures and sutures can be rendered absolutely sterile by placing the case for fifteen minutes in boiling water to which has been added one per cent. of carbonate of soda. The case is then taken out and after pouring out the water it is placed on the stove until its contents are dry, when they are placed upon an extemporized table covered by an aseptic towel. The hands of the operator and assistants are in the meantime rendered aseptic in the usual manner. During the operation the instruments are to be cleansed as often as necessary in sterilized water and laid upon the towel until needed by the operator. The best operating table will be the litter operating table. This table is composed of the litter upon which the patient is brought to the hospital placed upon the extension frame. Folding campstools will answer the purpose of tables for the wash-basins and instruments. Bricks, stone, sand or earth can be heated on the stove and will answer an excellent purpose in supplying the extremities with artificial heat during and after operation. The necessary stimulants, alcohol, camphor, nitrite of amyl, ammonia and strychnine should always be on hand to counteract the symptoms of shock. One assistant administers the anæsthetic while the other handles the instruments, handles the gauze sponges and otherwise assists the operator. A number of gauze compresses must be kept in readiness. During the operation sterilized water is used exclusively. If flushing is indicated this can be done by pouring warm water from a basin. During the operation the patient should be placed in a slightly inverted position for the purpose of increasing the blood supply

to the vital organs and diminishing the tendency to prolapse of the intestine.

#### OPERATION.

In the future the differential diagnosis between penetrating and non-penetrating wounds of the abdomen will be attended by less uncertainty than in the past, as in most instances the bullet will pass through the body in a straight line and the wounds of entrance and exit will indicate whether or not the abdominal cavity has been invaded. Prolapse of the abdominal organs, owing to the smaller size of the bullet wound, will be less frequently observed. If an operation is decided upon and the patient suffers from shock, one-twenty-fourth of a grain of strychnine should be given subcutaneously before the administration of the anæsthetic. No time should be lost in removing the patient's clothing, as such a procedure would tend to increase the hemorrhage and add to the existing shock. The boots or shoes should be removed and artificial heat applied to the feet, the abdomen laid bare, rolling pants and drawers downward sufficiently far to expose the pubes and the remaining clothing upward far enough to bring into view the costal arches on both sides. After the patient is fully under the influence of the anæsthetic, the abdomen is rapidly disinfected by washing with warm water and potash soap, shaving, washing with a 1:1,000 solution of sublimate and finally with alcohol or ether. The clothing in the vicinity of the abdomen is then covered with dry aseptic towels. Unless contraindications exist, the abdomen is opened in the median line as this incision affords the most ready access to the injured organ. In perforating wounds of the abdomen, profuse hemorrhage is more frequently of parenchymatous and venous than



terial origin. Gunshot wounds of the liver, spleen, kidneys, and the mesentery give rise to profuse and often fatal hemorrhage. After opening the peritoneal cavity it is often very difficult to find the bleeding points, as the blood accumulates as rapidly as it is sponged away, and it becomes necessary to resort to special means in order to arrest temporarily the profuse bleeding sufficiently to find the source of hemorrhage. One of two resources should be employed: (1) Digital compression of the aorta. (2) Packing of the abdominal cavity with a large number of gauze compresses. Digital compression of the aorta below the diaphragm can be readily made by the assistant introducing his hand through the incision, which in such cases must be larger than under ordinary circumstances. Compression of the abdominal aorta immediately below the diaphragm will promptly arrest the hemorrhage from any of the abdominal organs for a sufficient length of time to enable the surgeon to find the source of hemorrhage and carry out the necessary treatment for its permanent arrest. Hemorrhage from a perforated lacerated kidney may

demand a nephrectomy. If an injury of this nature is associated with a wound of the abdominal cavity the organ will probably be removed by laparotomy. If this method is employed the wound of the parietal peritoneum is sutured, and if necessary drainage established by a counter opening in the lumbar region. A similar wound of the liver is cauterized with the actual cautery, sutured or tamponned with a long strip of iodoform gauze, one end of which is brought out of the external wound.

At the last meeting of the German Congress of Surgeons, von Bergmann spoke strongly in favor of the suture as a hæmostatic agent in the treatment of wounds of the liver. He asserted that Glisson's capsule offered enough resistance to the sutures, while a number of other surgeons gave it as their opinion that the sutures would tear through. A round needle should be used invariably in suturing such a vascular organ as the punctures are less liable to bleed than if the ordinary surgical needle is used. It appears to me that on the battlefield the tampon should be relied upon in arresting hemorrhage



Field Hospital.

from wounds of the liver, as its use requires less time, and it serves at the same time the useful purpose of an efficient capillary drain. The use of the cautery is of course not to be thought of in the treatment of tubular wounds, and its employment will consequently be restricted to wounds of the surface of the organ or its lower border. A wound of the spleen, if the hemorrhage cannot be arrested by the antiseptic tampon, necessitates splenectomy as the tissues of this organ are too fragile for the successful employment of the suture as a hæmostatic agent. Hemorrhage from the pancreas must be controlled by antiseptic tamponnade, as this organ is not sufficiently accessible to permit ligation or suturing without too extensive evisceration and too great a loss of time. Very troublesome hemorrhage is often met with from wounds of the mesentery. The mesenteric veins are comparatively large in size, and the tissues surrounding them are not well adapted to effect spontaneous arrest of hemorrhage. When multiple perforations of the mesentery and visceral wounds of the stomach and intestines are the source of hemorrhage, it is a good plan to pack the abdominal cavity with a number of large gauze compresses, each secured by a strip of gauze which should be brought out of the wound to facilitate their removal, and as a safeguard against losing or forgetting them in the abdominal cavity at the completion of the operation. The compresses make sufficient pressure to arrest parenchymatous oozing as well as venous hemorrhage if they are placed at different points against the mesentery and between the intestinal coils. The compresses are removed one by one from below upwards and the bleeding points secured as fast as they are uncovered. The ligation of mesenteric vessels, both arteries and

veins, should be done by applying the ligature *en masse*. Thornton's curved hæmostatic forceps, or the ordinary aneurism needle, is the most useful instrument for this purpose. Catgut should never be relied upon in tying mesenteric or omental vessels, as this material for several reasons which it is not necessary to mention here, is greatly inferior to fine silk. The omentum and mesentery must be tied in fine sections, the ligatures firmly drawn, and if a part of either of these is excised the incision should be made at least half an inch from the ligatures to prevent their slipping. Troublesome hemorrhage from a large visceral wound of the stomach and intestines is best controlled by hemming the margin of the wound with fine silk. If hemorrhage is profuse from any of the causes which have been enumerated, this must be attended to before anything is done in the way of finding or suturing of the visceral wounds.

#### TREATMENT OF VISCERAL WOUNDS.

Clinical experience and experimental research have demonstrated beyond all doubt that visceral wounds of the stomach and intestines large enough to give rise to extravasation are with but very few exceptions mortal injuries. The danger arising from such wound is, of course, much greater when the organ injured is in a condition of active physiological function; on the other hand, if the organ is in a state of rest extravasation is less liable to occur and consequently a greater possibility of spontaneous healing of the visceral wound. For this reason we find numerous records of recovery from pistol-shot wounds of the stomach, this organ having been empty at the time the injury was received. More numerous are the instances in which patients have recovered from perforating wounds of



the abdomen in which the clinical symptoms did not indicate the existence of any visceral injuries. I have been convinced for years that a bullet passing through the abdominal cavity does not produce visceral injuries as constantly as we have been taught to believe. I made fourteen experiments on the cadaver for the purpose of ascertaining the comparative frequency of visceral injuries in perforating wounds of the abdomen. In four of these experiments the bullet passed through the abdominal cavity in an antero-posterior direc-

would tend to destroy life. In regard to the direction of the bullet, it may be said that if it has crossed the abdominal cavity in an antero-posterior direction at or above the umbilical level, the stomach and intestines may have escaped injury, while if it has passed from side to side or obliquely at a point below the umbilicus, it is not only almost certain that it has injured the intestines, but it is almost equally certain that it has produced from three to sixteen perforations.

The treatment that has been advised



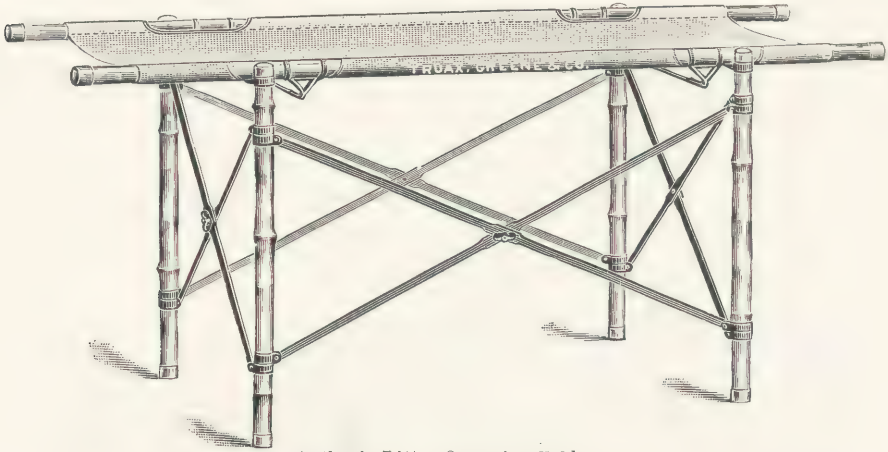
Laparotomy on the Battle-field.

tion without producing any visceral injury which would require surgical interference. In two out of six cases of penetrating gunshot wound of the abdomen that have come under my own observation laparotomy revealed the absence of visceral wounds. Laparotomy should not be performed simply because a bullet has entered the abdominal cavity, but its performance should be limited to the treatment of intra-abdominal lesions which, without operative interference,

for the arrest of hemorrhage from the liver, spleen, pancreas and kidneys is about all that can be done for gunshot wounds or these organs. A more complicated and difficult task confronts the surgeon in the treatment of visceral wounds of the gastro-intestinal canal. If the location of the wound of entrance and direction of the bullet indicate the existence of a wound of the intestinal canal below the ileo-cæcal valve, a speedy and positive diagnosis can be

made after the patient is under the influence of the anæsthetic, by insufflation of air *per rectum*. If this test yields a positive result, median laparo-

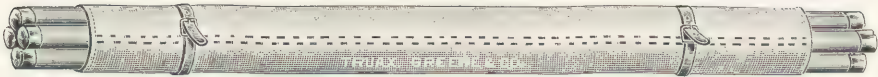
at once, the lowest perforation located by rectal insufflation. When this has been done the air from the intestinal canal below the perforation should be



Author's Litter Operating Table.



Author's Field Operating Table, Folded.



Operating Table and Litter, Folded.

tomy is to be performed at once, the wounds located by the same test and sutured. In the majority of cases two wounds will be found. If the small intestines are out of range of the track made by the bullet, further search for perforations is not only unnecessary, but harmful. Careful toilet of the peritoneal cavity in the vicinity of the intestinal wounds by flushing or mopping is always necessary in such cases. If considerable extravasation has taken place, drainage should be provided for in addition. If the direction of the track of the bullet is such that it is probable that the small intestines are injured the abdomen should be opened

removed as far as possible, when the insufflation is made from this point in an upward direction in search of additional perforations. If additional perforations are found, the intervening portion of intestine is emptied of air, the first perforation closed by suturing, and the process repeated until the entire intestinal canal has been tested by this method. Extensive eventration is prevented by reducing the part of intestine examined and treated as fast as the exploration is made.

By adopting this method the surgeon guards absolutely against leaving an undiscovered wound which has in so many instances been the immediate



cause of death after laparotomy for gunshot wounds of the abdomen. If the wound of entrance and direction of the bullet point to the probable existence of a wound of the stomach, insufflation of the stomach through an elastic stomach tube will prove a most valuable diagnostic measure, and is occasionally the only way by which a second perforation of this organ can be detected, as is the case if it involves the smaller curvature or the posterior wall. The suturing of the wound is done in the quickest possible time and in the simplest manner. If bleeding has not ceased it is arrested by hemming

a number of wounds are found in close proximity. In such cases extravasation during the operation is prevented by constricting the bowel on each side with a strip of gauze passed through a small button hole in the mesentery close to the bowel, made with a pair of hæmostatic forceps and tied sufficiently firm to prevent escape of intestinal contents. If any part of the sutured bowel presents conditions that might endanger the healing process, it should be covered by an omental graft. The operation must be completed as rapidly as possible, hence the toilet of the peritoneal cavity and suturing of the ex-



Author's Litter. Weight  $7\frac{1}{2}$  lbs.



Litter, Folded.

the margins of the wound by a continued suture of fine silk.

The closure of the wound is effected by Lembert stitches, about six to the inch, which must include a few fibers of the firm sub-mucous coat on each side. Trimming of the contused margins is superfluous. An ordinary sewing needle and fine-braided silk should be used in suturing the visceral wounds. As a rule the line of suturing should be made transversely as stenosis is less liable to occur and the vascular supply to the parts coaptated is less likely to be compromised than would be the case if the wound is closed in a direction parallel to the long axis of the bowel. Enterectomy and circular suturing may become necessary if the wound involves the mesenteric side of the bowel, or if

ternal wound must be completed with as little delay as is compatible with the safety of the operation. A single row of sutures including all of the tissues of the abdominal incision, will answer the purpose in closing the external incision. The omentum must invariably be drawn down sufficiently far to cover the abdominal incision, as this procedure is best calculated to prevent subsequent adhesions of the remaining abdominal organs to the inner surface of the external incision. If the patient has lost a dangerous amount of blood a saline intravenous infusion will often prove the means of preventing death from this source. The solution should be prepared by dissolving in a quart of warm sterilized water the requisite quantity

of pure sodic chloride, kept in readiness for this purpose. The after-treatment must have in view mainly to meet the symptoms of shock caused by the injury and the operation. Rest, external dry heat, subcutaneous injections of strychnine and alcoholic stimulants will meet this indication most satisfactorily. Absolute diet for the first three or four days with rectal alimentation constitute an essential part of the after-treatment.

modern surgery will be to extend the recent achievements of abdominal surgery to the battlefield. I am painfully conscious of the fact that the professional military surgeons will regard the suggestions that I have made in this direction as immature and imperfect, but if I have succeeded in awakening their interest in this matter the principal object in the preparation of this address will be realized.



Author's Pannier and Dressing-Case. Weight including contents, 70 pounds.  
All articles contained in Aluminum cases.

A saline cathartic should be given as soon as tympanites makes its appearance regardless of the length of time that has intervened since the operation. I am firmly convinced that abdominal surgery has a great future in military practice. It is the duty of the proper military authorities to make ample provision for initiating a well-matured plan of procedure calculated to save occasionally a life upon the battle-field in cases heretofore beyond the reach of surgery. The nations that spend millions of dollars annually in perfecting their methods of warfare should not remain unconscious of their full duty to the wounded of future conflicts, and one of the most urgent demands of

In conclusion permit me to formulate the salient ideas on this subject in the following conclusions:

1. Abdominal surgery will extend its life-saving work to the battlefield of future wars.

2. The treatment of dangerous internal hemorrhage and visceral wounds of the abdominal organs by laparotomy in military practice is a justifiable and legitimate procedure, which merits the earnest consideration of every military surgeon and deserving of the most serious attention of the proper military authorities of all civilized nations.

3. The first aid to those suffering from gunshot wound of the abdomen and in which life is threatened by hem-



orrhage should consist in compression over the injured part and auto-transfusion by circular constriction at the base of one or more extremities.

4. Operative treatment of gunshot wounds of the abdomen should be resorted to promptly in appropriate cases, and for this purpose the wounded should be transported from the fighting line to the field hospital with great care and without delay.

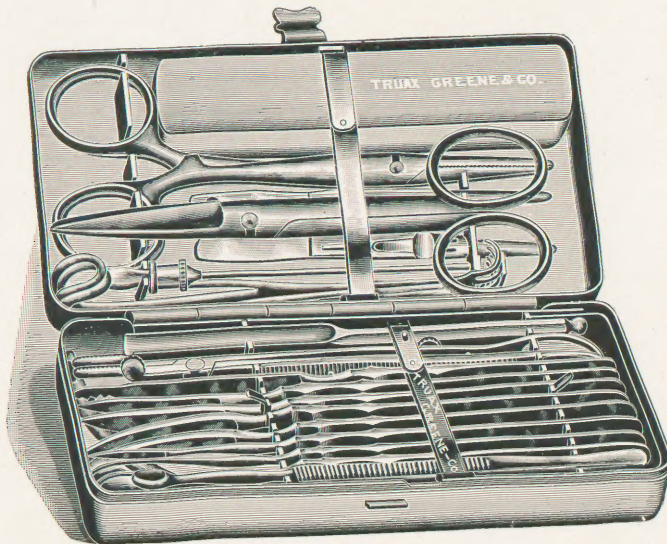
5. The field hospital should be equipped with the necessary instruments and outfit to perform aseptic operations.

treatment by suturing, aseptic tamponade, or actual cautery.

9. Wounds of the spleen and kidney, if not amenable to the same treatment, may require removal of the injured organ.

10. Wounds of the stomach and intestines large enough to permit extravasation with very few exceptions result in death, and should therefore be subjected to direct operative treatment before serious complications set in.

11. Distension of the stomach and colon by insufflation of air before



Author's Emergency Pocket Operating Case.

6. After opening the peritoneal cavity by a median incision temporary hæmostasis can be secured for the purpose of arresting dangerous arterial hemorrhage by digital compression of the aorta below the diaphragm and venous hemorrhage or parenchymatous bleeding by sponge compression.

7. Permanent hæmostasis must be secured by ligature or aseptic tamponade.

8. Visceral wounds of the liver and pancreas are amenable to successful

laparotomy and of the small intestines through one or more perforations after the abdomen has been opened, is a valuable diagnostic test.

12. Wounds of the stomach and intestines can be quickly and safely closed by one row of sero-muscular sutures including a few fibers of the submucous fibrous coat.

13. The after-treatment should consist of such measures as will most successfully combat the symptoms of shock and secure rest for the injured organ.







